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Electronic Business®

FOR MANAGEMENT IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES
JANUARY 21, 1991

ERICSSON MAPS CELLULAR GROWTH

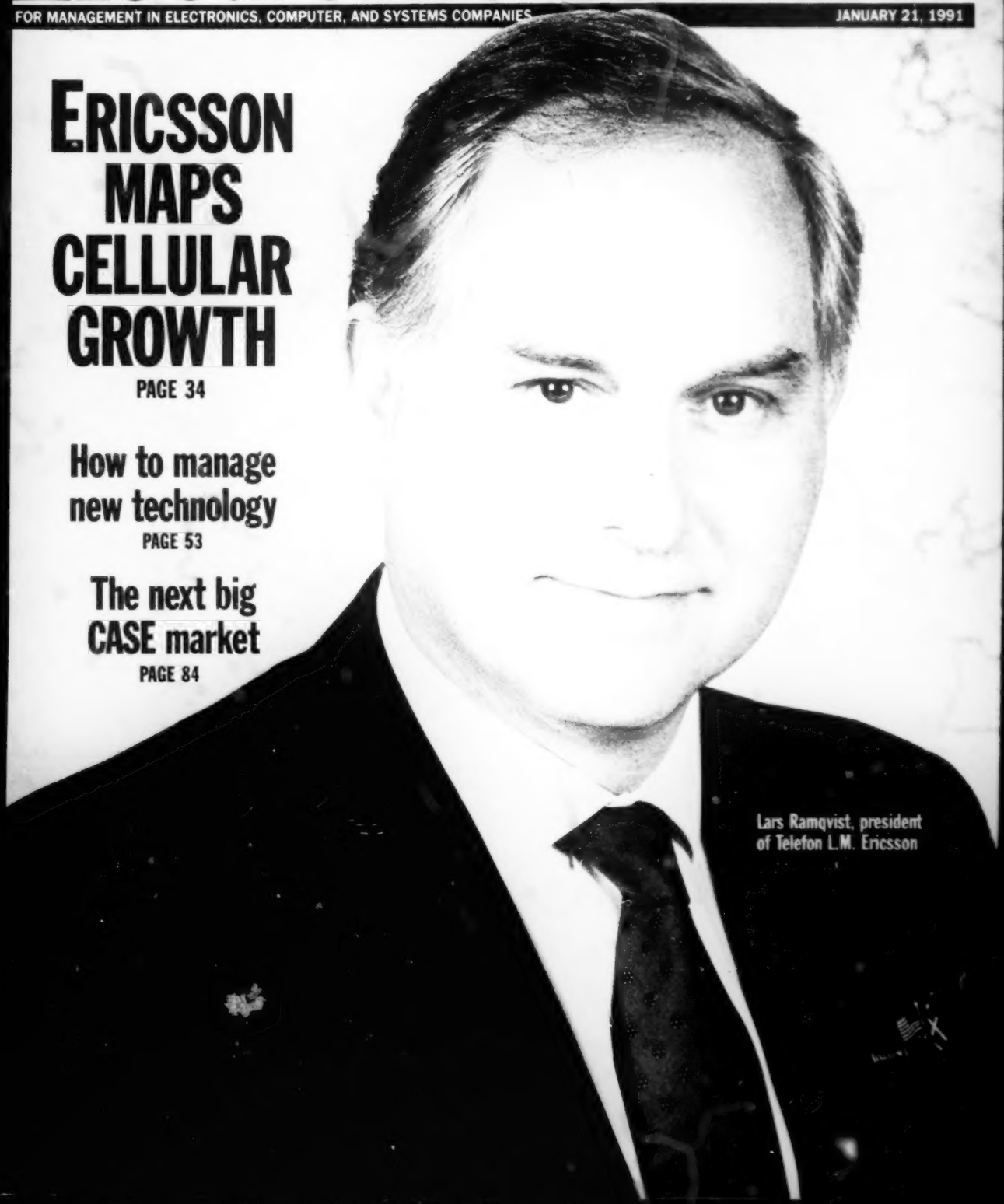
PAGE 34

How to manage new technology

PAGE 53

The next big CASE market

PAGE 84



Lars Ramqvist, president of Telefon L.M. Ericsson

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES—WORLDWIDE

VOL. 17, NO. 2 JANUARY 21, 1991

PAGE 34 President Lars Ramqvist: Ericsson "has to face the market as one company, not as six divisions"

Cover: Peter Damroth

COVER STORY/ERICSSON

34 Ericsson adapts to deregulated global market

Sweden's electronics giant has responded to telecommunications deregulation with a major overhaul that made it far more entrepreneurial and market-driven. The radio communications division is now the fastest-growing business, outstripping the success of Ericsson's traditional core business in public switches

UPDATE

15 Business Trends
Apple's new RISC venture; AT&Tackers at the gate; portables lead Japan's PC exports; Jessi opens door to IBM; European software demand helps U.S.; DAT versus DCC in tape-format faceoff; final farewell at Data General; European defense companies feel pinch; changes in Baldrige guidelines

25 Economic Trends
A sluggish year ahead for electrical product shipments; quarterly data shows strength in exports

29 Companies to watch
Cadis puts manufacturing specs into the database; Resumix AI software matches resumes to jobs; Augment Systems links supercomputers with fiber

ERICSSON

34 Ericsson adapts to deregulated global market
The demand for cellular technology is paying off for Ericsson, which has amassed a 40% share of the global cellular market. By the end of the decade, the company's share could reach 50%, which by then will add up to some 100 million subscriber lines, predict analysts

STRATEGIES

38 How Silicon Systems turns yen into dollars
Acquisition by a Japanese company may seem like a tragedy to some, but it brought a new lease on life for Silicon Systems Inc. Investment by Tokyo-based TDK Corp. already has paid off for SSI with production of a programmable filter IC pegged to hard-disk drives, reportedly the first single-chip device to perform this function

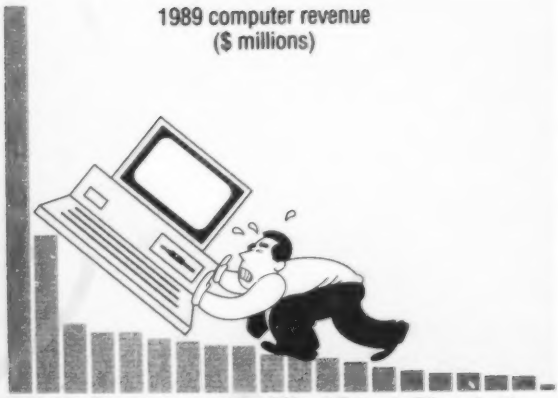
MANAGING RESOURCES

53 Managing technology at warp speed
With product breakthroughs every few months, it is all too easy to be left in your competitors' dust. Here are some companies that excel at predicting and managing new technology and integrating the technology into marketable new products

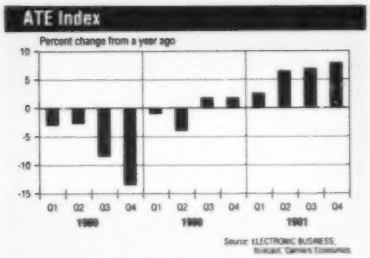
EUROPE BUSINESS

63 Rad spreads risk through product diversification
Rad Data Communications has taken niche production to a very successful extreme. The Israeli company's engineers tap distributors for their wish lists of perfect products, then develop them at the rate of one new product every two weeks. Rad's annual growth rate: 50%

PAGE 63 Rad's Ami Amir complains that high U.S. volumes come at the expense of profitability



PAGE 73 Exports account for 90% of Taiwan's PC production, so the worldwide slowdown hurts



PAGE 98 Expansion ahead for instruments and controls

PAGE 38 SSI CEO Santoro no longer a slave to Wall Street

PAGE 53 Only about 2% of researchers are true innovators, claims Beckman's James Osborne

ASIA PACIFIC BUSINESS

73 A tough road ahead for Taiwan's PC makers

It's a small world: A Taiwan government official recently warned that the nation will lose 5% of its exports to the United States if America's economic growth falls by 1%. But the weakening of the world economy is not the only thing worrying Taiwan's PC makers

MARKET PERSPECTIVES

81 Multibus II stages comeback in communications

A technology in search of applications; that was the plight of single-board computer bus architecture Multibus II after VMEbus appeared in volume. But new markets may provide Multibus II with the steam it needs to compete

MARKET PERSPECTIVES

84 CASE vendors look to the past to find their future

Manufacturers of computer-aided software engineering products are finally tuning in to their customers biggest problem: MIS maintenance. The result may be a remedy for disappointing sales of conventional CASE products

BUSINESS BAROMETER

97 Lead times
Prepare for price rise as lead times stretch

98 Instruments and controls
Two-year growth upturn will begin this year

DEPARTMENTS

5 **Inside Business**
9 **Letters**
93 **My View**
My barber looks at the economy. Again
90 **Advertiser Index**
100 **Viewpoint**
Answering the industry's $300 billion question

COMPANIES IN THIS ISSUE

90 **An index of the companies covered in this issue**

EDITORIAL STAFF

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Editor: Jeffrey Bairstow

Managing Editors: H. Garrett DeYoung, Bruce C.P. Rayner

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Senior Production Editor: Karen J. Covey

Assistant Production Editor: Maura A. Baker

Editorial Assistant: Jean O'Brien

ART STAFF

Art Director: Michael Roach

Associate Art Director: Carla Aguilar Leeder

Staff Artist: Michele G. Kane

EDITORIAL OFFICES

Boston: Cahners Building
275 Washington Street, Newton, MA 02158
(617) 964-3030 Telex: 94 0573 CPC BSN
Fax: (617) 558-4327 MCI: EBBOS

San Jose, Calif.: Teri Sprackland
Sherman Building, 3031 Tisch Way, Suite 100,
San Jose, CA 95128 (408) 243-8838

Northwest: Dwight B. Davis
2924 Queen Anne Ave., N.
Seattle, WA 98109 (206) 284-5130

London: Barbara N. Berkman
27 Paul Street
London EC2A4JU England 011-44-71-628-7030
Fax: 011-44-71-628-5984

PRODUCTION

VP Production: Wayne Hulitzky

Director of Production/Manufacturing: John R. Sanders

Production Supervisor: Andrew A. Jantz

Production Manager: Betsy Harkins; (617) 964-3030

CIRCULATION

Circulation Manager: Ann Ward
44 Cook Street, Denver, CO 80206
(303) 388-4511

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Riding the wave of technological change

Imagine electronics product development as a day at the beach: sunny, 80 degrees, wind steady, waves cresting at regular intervals, the big swells visible a mile out. Simple, predictable, no hassle.

Well, that was yesterday or the day before. This is today: A new generation of products appears every six months, and the average product life cycle is only 18 months long. It still takes you two years to get your product from drawing board to distributor, so it's already obsolete. The competitors are circling offshore. Surf's up.

Dave Webb: on the job in Silicon Valley

Managing technological change is the leitmotif of this issue of ELECTRONIC BUSINESS. If your taste in metaphor runs more to *Star Trek* than to surfing, consider the words of Michael Swavely, president of North America Compaq. From his perspective, the computer industry is changing "at warp speed." That means "you simply can't plan products two or three years in advance," Swavely told managing editor Garrett DeYoung. Swavely's insight provided, among other things, a headline for Garrett's story in this issue's Managing Resources section.

Fortunately, Garrett reports, even small companies can learn to predict—and catch—the next technology wave. So can some very large companies. From London, senior editor Barbara Berkman reports that a reorganized Telefon L. M. Ericsson—Sweden's largest electronics group—is shaking off bureaucratic habits and capturing important territories in the U.S. and European cellular communications markets.

Nowhere does the technological wave roar louder than on the shores of Northern California. Patrolling those shores for ELECTRONIC BUSINESS is no one-person job—even for senior editor Teri Sprackland. We are pleased to welcome Dave Webb who, as associate editor, will work with Teri in our San Jose office.

Dave's beat is microcomputer systems, and he is well qualified to cover it. As West Coast storage and systems editor for Digital News, he wrote about hardware and software products of interest to DEC users. As a reporter for Computer Systems News, Dave covered both storage and image-processing markets.

His feature contribution to this issue fits right in with the managing-technology theme. It is the saga of Multibus II, the single-board computer bus architecture that went aground after competing technology took to the seas. Dave reports that the rising tide of demand for telecommunications and data communications applications may yet rescue Multibus II. Welcome aboard, Dave.

JOHN PARKER, section editor

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VBPA ABP

expected to create a feeling of confidence in AT&T on the part of NCR people."

Mergers within the computer industry have a poor track record, even when they have been friendly. Unisys Corp. continues to struggle four years after its creation through the combination of Burroughs Corp. and Sperry Corp., the computer industry's largest merger.

IBM's acquisition of telecommunications vendor Rolm Corp. never lived up to expectations. AT&T's own investments in Sun Microsystems Inc. and Ing. C. Olivetti & Co. have produced less than spectacular results.

AT&T's failed foray into the computer market has cost the company more than $2 billion since 1984. What it needs, more than a product line or an installed base, is management experience in the computer industry. Unless it treads carefully, AT&T could lose NCR's most valuable assets and find itself with a $6 billion albatross.

RICK WHITING

PERSONAL COMPUTERS

Portables take the lead in Japan's PC exports

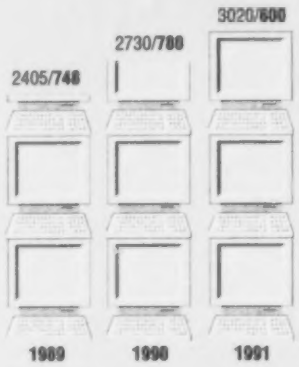
U.S. PC MAKERS can expect to see greater numbers of advanced portable personal computers made by their Japanese competitors hit the world marketplace, despite the fact that Japan's growth in overall PC exports has been slowing.

Japanese PC makers produced 327,000 laptops and notebook PCs in the first quarter of 1990, obtaining a 86% quarterly growth rate in production of those categories of PCs, according to a recent report by the Electronics Industry Association of Japan (EIAJ). The Japanese fiscal year begins April 1.

Japan's total PC production in the first quarter of fiscal 1990 reached 644,000 units. Of the 160,000 PC units exported in that quarter, 110,000 were portables, or 69% of the country's total PC exports. It was the first time Japan exported more portable PCs than desktops. In terms of sales, portable PC exports generated $193.8 million, or 85% of the quarter's $226.8 total PC export revenue.

Japan's PC production & exports

(units in thousands, total/export)



Source: Electronics Industry Association of Japan

Although the quarter's PC export revenue increased 20%, the total number of PCs exported declined by 6%, mostly because Japanese manufacturers have quickly upgraded from 8-bit to 32-bit microprocessors. According to the EIAJ report, the quarter's production of 8-bit-based personal computers dropped 57%, while the 32-bit models registered 79% growth, and production of 16-bit PCs increased 6%.

Europe appears to be the largest market for Japanese manufacturers. They sold 96,000 units there, for a healthy increase of 22%, compared with North America's 26,000 units and modest 2% growth. Although the Asia-Pacific market absorbed only 15,000 units in the first quarter of fiscal 1990, its growth rate reached about 72%.

In fiscal 1989, Japan's PC exports increased 22% and generated $897 million in revenue. However, EIAJ forecast that Japan's PC exports would total $864 million and register a 3.6% decline in the 1990 fiscal year that ends March 31. It also forecasts that Japan's PC exports will continue to drop 4.3% in fiscal 1991.

While Japan's PC manufacturing industry will be able to carry a 11.7% compounded annual growth rate to the end of fiscal 1991, says the EIAJ report, the PC makers will have to sell more and more PCs to the domestic market.

But since there are only 86 PCs for every 1,000 Japanese, compared with 176 units per 1,000 Americans, it seems the Japanese PC makers will not have to worry about saturating their domestic market in the future.

XIONG XIAOGE

SEMICONDUCTORS

Consortia mend fences, open door to IBM

JESSI AND SEMATECH ironed out their differences in December, paving the way for IBM Corp. to officially join the research consortium designed to revive the European microelectronics industry. Jessi is the $4 billion, government- and industry-funded initiative for more than 100 European chip makers, semiconductor equipment manufacturers, and computer and telecommunications end-users.

Jessi invited IBM to join two projects: a deep ultra-violet lithography project for producing 0.3 micron chips and another for preparing gate dielectrics by rapid thermal processing. Later, IBM will probably join more of the 50 projects comprising Jessi.

In return, Jessi will cooperate with Sematech. Jessi set up a project specifically to address collaboration between the two consortia.

Unofficially, IBM was involved in Jessi through its work with Siemens AG on developing a 64-megabit DRAM. Jessi funding contributes to the cost of setting up a production line to make the 64-Mb, and the process technology will be shared with Jessi members. But any product-specific research will be proprietary to IBM and Siemens alone.

Meanwhile, European governments are balking at funding Jessi, whose officials have been urging the European Community to pony up more money for Jessi. Reportedly, the EC has funded only 7% of the 1990 budget instead of the 25% it was slated to kick in.

Ever since N.V. Philips withdrew from Jessi's SRAM research, while remaining in 20 other projects, the Dutch government has halted additional Jessi funding until it evaluates the impact on the Dutch information technology industry. Meanwhile,

SGS-Thomson Microelectronics and Siemens AG are taking up the slack in researching basic memory technology as it applies to RAMs and EPROMs.

On another front, IBM announced it is relocating its 120-employee Communications Systems unit headquarters to the London area. The division develops intercomputer networking products and services. Observers say the relocation illustrates IBM's commitment to OSI, the standard heralded in Europe. It is the first time IBM moved a product group outside the United States.

The move coincides with IBM's announcement of 1991 cuts in its European workforce of 108,800. The early retirement provisions are part of IBM's worldwide job-shedding program.

BARBARA BERKMAN in London

SOFTWARE

European demand defies U.S. slump

IF THE DAYS of soaring high-tech sales growth seem gone with the wind, take heart from Europe's unabated hunger for U.S.-made software. Even in a near-recessionary climate, a group of 32 U.S. software developers racked up sales of $228.8 million in the third quarter of last year, 63% more than in the third quarter of 1989, reports the Software Publishers Association (SPA).

That growth follows 48% growth in second-quarter sales. "The European market continues to defy forecasts of a slowdown," says Ken Wasch, executive director of the 720-member Washington-based trade group.

The SPA report, prepared by consultant Arthur Andersen and Co., shows 61.1% third-quarter sales growth for DOS/Windows-based software and 82.7% third-quarter growth in Macintosh-based software. As in the U.S., applications for Microsoft's Windows were a hot item: Windows software sales grew 243% in the third quarter, according to the SPA report. Other companies surveyed for the report include Lotus, Ashton-Tate, WordPerfect, Claris, Aldus, and Borland.

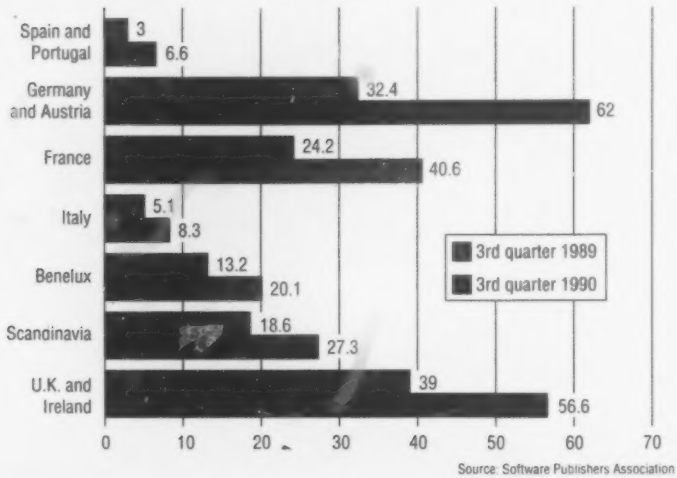
Germany and Austria provided the largest market for the 32 U.S. companies in the third quarter: $62 million. Spain and Portugal posted the highest rate of sales growth for the period: 120%. The SPA estimates that sales of U.S.-developed software products represent nearly 70% of the total software market in European countries.

JOHN PARKER

Europe splurges on U.S. software

Survey of 32 companies shows 63% sales growth

(sales in $ millions)



Source: Software Publishers Association

DIGITAL AUDIO

It is DAT versus DCC in tape-format faceoff

JUST WHEN YOU thought it was safe to go out and buy those DAT players, along comes DCC.

For the acronym-averse, the latter means "digital compact cassette." And just as it seems that digital audio tape (DAT) players were shaking off copyright-protection red tape, the Netherlands' Philips and the U.S.'s Tandy Corp. announced they were co-developing an alternative. DCC, it seems, will be able to play both analog and digital prerecorded tapes. In short, it looks like there will be another format war, much like Betamax versus VHS.

Not all observers see it that way, though. Like the HDTV race, some see it as an East versus West issue; so far only Japanese companies have produced both the hardware and software for DAT. Others see it as a hardware versus software war: DCC consumers won't have to ditch their current collection of analog cassettes, and they will be able to digitally record on DCC.

Either way, most feel that DCC will steal some of DAT's thunder. DCC also gives record companies some breathing room—they won't, at least for a while, have to commit entirely to the DAT format. Philips's subsidiary Polygram and a few other recording studios have already come out in support of DCC. So far, only CBS Records, a subsidiary of Sony Corp., offers pre-recorded DAT tape.

Philips intends to launch DCC sometime in 1992.

"It is really a war of wits, not us versus them," according to Walter Miao, analyst for New York City-based Link Resources. "What it amounts to is: Philips can't catch up in DAT, but it can take it one step further."

Miao also points out that the Japanese—even with the proposed acquisition of MCA Corp. by Matsushita [ELECTRONIC BUSINESS Nov. 26, 1990]—don't control enough of the entertainment software distribution to designate DAT as the new standard. "The recording community today is controlled by the studios, and the studios control 95% of the distribution of prerecorded music." He

SHIPMENTS

A sluggish year ahead for shipments, says NEMA

FLAT AS FAR as the eye can see. That is what the National Electrical Manufacturers Association predicts for electrical products shipments this year. That is not good news for the myriad companies in the high technology field, which is used to double-digit growth rates. "Things look rocky," says Bernard Falk, NEMA's president.

On average, NEMA predicts a mild .02% decline in shipments overall for electrical products; that is a slight improvement from an expected drop of .07% for 1990.

The results from NEMA's study come from a survey, conducted in late 1990, of 300 member companies in nine major industry segments: industrial automation, lighting equipment, electronics, industrial equipment, building equipment, insulating materials, wire and cable, power equipment, and diagnostic imaging and therapy systems. In all, NEMA tracks 65 individual subsectors of the industry. For 1991, 20 of these subsectors expect negative growth this year, 19 will be flat, and the rest will see some positive growth.

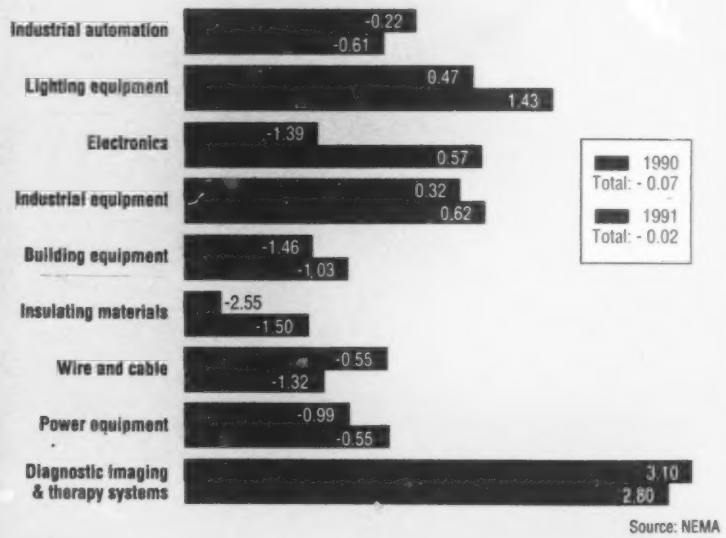
The bright spots for 1991 seem to be largely in emerging technologies. The diagnostic imaging and therapy systems, for example, will average 2.8% growth in shipments, down from 3.1% in 1990. Within this group, medical image archiving and communications equipment will post 20% growth, while lithotripters (devices used to treat kidney stones) will post 50% growth. In the electronics segment, traffic-control systems will post a healthy 5% growth for the year.

The worst-hit segment is expected to be insulating materials—including laminates, resins, tubing, and sleeving—where growth is predicted to be a negative 1.5%, up from a negative 2.6%.

NEMA expects strong U.S. exports in 1991 if foreign economies continue to grow. When the dust settles, exports for 1990 for all nine industry segments should be $2 billion higher than 1989, while imports will have grown only $370 million. □

Sluggishness behind, sluggishness ahead

(weighted average of year-end domestic shipments growth in real terms)



Source: NEMA

TRADE

Third-quarter data shows strong exports

U.S. EXPORTS of electronics-based products posted strong growth through the third quarter of 1990 while imports grew only modestly, reports the American Electronics Association. This resulted in a "substantial improvement" in the balance of trade for the industry as a whole.

Altogether, worldwide exports grew to $52.5 billion during the first nine months of 1990, up 15.4% from the same period in 1989. Imports for the first nine months of 1990 increased just 2.7%, to $53.7 billion from $52.3 billion for the same period in 1989. The U.S. trade balance for the first nine months of 1990 was a negative $1.2 billion, down significantly from the $6.9 billion balance for the same period in 1989.

After peaking in 1986 at $13.1 billion, the electronics balance of trade declined steadily to $9.6 billion in 1989. If the pace during the last few months of 1990 is any indication, the annual trade balance for 1990 will show a dramatic improvement. The AEA estimates, in fact, that the U.S. trade balance for all of 1990 will shrink to $1.9 billion. The association's full-year estimates show improvement in trade of telecommunications products and semiconductors, but not in computers or instrumentation products.

According to the AEA, the U.S. has improved its trade balance with all its major trading partners during the nine-month period largely because of a weakening dollar and a sluggish domestic economy. Even the U.S. balance of trade with Japan, which has been hovering around $20 billion annually, shows signs of moderating.

The U.S. increased its exports to Japan by 9.1% for the nine-month period, to $6 billion. During the same period, imports fell by 5.4% to $19.3 billion, for a total trade balance of negative $13.4 billion.

BRUCE C.P. RAYNER

How Silicon Systems turns yen into dollars

Acquisition by Japan's TDK Corp. will finance the California chip maker's entry into higher-growth markets

BY TERI SPRACKLAND

To those who worry that the late 20th century is witnessing the end of America's dominance in electronics, the sale of another U.S. company to the Japanese may be a fate worse than death.

But for Silicon Systems Inc., the 1989 acquisition by Tokyo's TDK Corp., producer of magnetic tape and electronic components, has meant a new lease on life—and the money to hang tough through soft markets. Today, managers at Tustin, Calif.-based SSI are confident that they can grow in the fiercely competitive automotive electronics market while still investing in their core business of providing chips to the modem and disk-drive industries.

The relationship may not sit well with some, but Carmelo J. Santoro, SSI CEO and president, takes a pragmatic view. "The money has to come from somewhere, or we as Americans will totally lose our ability to compete," he says. "SSI is now creating things in America that American dollars couldn't do. I have turned yen into dollars."

The marriage of the two companies has already paid off with SSI's introduction of a programmable filter IC pegged to hard-disk drives, reportedly the first single-chip device to perform this function. The chip could also be used in LANs, digital transmission equipment, car telephones, and video systems, and will be marketed through TDK's distribution channels.

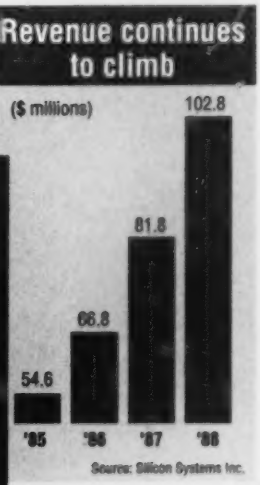
The long-term payoffs for both companies are much higher. Because of TDK's investment (reportedly $100 million or more in new U.S. production), SSI is now eyeing annual sales of at least $1 billion by the end of the decade, versus last year's $140 million. And thanks to SSI's prowess in mixed ASIC design, the acquisition should serve to beef up TDK's efforts to become a major player in the international semiconductor business. SSI will form the core of TDK's semiconductor strategy. Japanese corporate estimates are that TDK's chip sales will grow by 25% in the next five years. "[SSI] is a nice match for us," says Yutaka Mori, SSI's senior vice president of planning and coordination.

In the past, SSI had relied on a niche strategy of providing highly focused products for specific applications, namely disk drives. In fiscal 1988, disk-drive related chips provided $95.8 million of the company's revenue of $120.8 million; communications chips brought in $21 million. In August 1988, the company had even expanded with the $21 million acquisition of an idled AT&T fab in Santa Cruz, Calif., near major customer Seagate Technology.

But that niche approach eventually fell victim to the volatility of the marketplace. As disk-drive makers' profitability and sales plummeted, their chip suppliers—including SSI—felt the pinch. By mid-1988, the industry was saddled by overcapacity and price-cutting, according to analysts at Dataquest Inc. in San Jose. Disk-drive sales on the volatile spot market had flourished; in fact, Seagate had at one point received more than half of its sales revenue from this channel. The efforts of several key OEMs to produce their own drives also curtailed sales opportunities. If that weren't enough, the industry had to cope with two other factors: too much competition from start-ups funded by lavish quantities of venture capital from the early 1980s and a product transition from the 5.25- to 3.5-inch drives.

The result was that, although the company's 75% share of the market for disk-drive chips was a strength during fiscal 1988, it had become a liability by the next year. During the six years prior to the acquisition, SSI grew at a compounded annual growth rate of 40%. But by late 1988, new orders had plunged by 52%, a 35% decline from

SSI CEO Santoro: no longer a slave to Wall Street



the same period in the previous year.

The situation worsened during early 1989 when new orders fell by 19% and income dropped 47% compared with a year earlier. In one quarter, SSI's book-to-bill ratio went from 1.0 to 0.4, recalls William Tai, vice president with investment firm Alex. Brown and Sons in San Francisco. "They had good technology and good products, but the disk-drive market sector has historically been subject to great volatility," says Tai.

With equity too low and interest rates too high, says Santoro, it proved impossible to raise the needed capital on the open market. "The driving force in the acquisition was our need for capitalization," he recalls. "We were hopelessly trapped as a small but technically capable company." Now, he says, SSI's debt to TDK is funded at "an embarrassingly low" rate of interest.

Stopping the slide

With its financial problems in check, the company is now able to focus more of its energies on developing sales in the automotive electronics market and appears to have made some progress (including some business from Ford), according to Tom George, vice president of worldwide sales. Pursuing that goal will be a long-term effort, he says, but one that the company can now afford. "We are making some headway, but it is slow going. It can be years from concept to use in the automobile," George notes.

In August, SSI announced an agreement with Integrated Semiconductor Solutions of Santa Clara, Calif., a company specializing in automotive and industrial application ICs and boards, to design and market mixed-signal ICs for automotive sensor-control applications. The designs are to be contributed by Integrated Semiconductor Solutions, with SSI contributing foundry, design tools, and product engineering support. Both companies will market the resulting products.

The automotive electronics markets will grow by about 8% annually through 1995, notes Paul Hansen, president of market research firm Hansen Associates in Goffstown, N.H. And according to Market Intelligence Research Co., the worldwide automotive embedded-control market was $507 million in 1987 and will top $1 billion by 1995. Motorola remains the leader in the North American merchant market for automotive electronics with a 24% share.

SSI can now afford to design quality into its products instead of testing it in

Meanwhile, SSI is also moving into the 9,600-baud modem market, another technology investment that the company could not afford until TDK came along, says George. One target sales area are modems pegged to laptop and notebook computers.

Santoro admits that SSI's shortage of cash before the acquisition had taken a heavy toll in other ways. SSI had always held to its marketing strategy of identifying and fulfilling niche demand for products that could have long production runs. But other factors—including product quality—did not receive the same attention. "We never found the time to improve quality," according to Santoro. "I used to have to say 'no' to a lot of things that we should have done. As a result our quality was mediocre—average at best."

That has changed since TDK and its high product standards entered the picture, he says. Instead of testing for reliability after manufacturing, for example, the company now places a special emphasis on building quality into the design and production processes. During the past year, says

TDK fulfills a long-time goal

Japan's TDK Corp. was founded in 1935 to industrialize ferrite, a Japanese invention, notes Yutaka Mori, SSI's senior vice president of planning and coordination. The materials were pegged to computer memory systems until ferrite memories gave way to semiconductor memories.

Following that switch, TDK tried unsuccessfully to develop its own internal silicon capability. Still determined to break into the memory business, the company tried during the 1970s to form a joint venture with Fairchild Semiconductor, again without success.

With the acquisition of Silicon Systems Inc., however, TDK hopes that its patience will be rewarded. "Our traditional area in passive components has been growing very slowly—7% to 8% a year," says Mori, compared with 15% a year for integrated circuits. SSI's strength in mixed ASIC design is beneficial to TDK's plans for sales in both the United States and Japan. "It will be nice to compete head to head with companies like NEC without dumping money into DRAMs," Mori notes.

Although Mori characterizes SSI as having been fairly successful in marketing its products in Japan through a trading company, direct sales through TDK will undoubtedly increase revenue. "TDK knows the Japanese competition," explains Mori. "Eventually we would like to open a fab in Japan because the demand for our type of ICs is growing very rapidly there."

By late August 1990, quarterly results for TDK showed about a 15% jump in net earnings and sales, to $43.9 million income on $839.9 million in sales, up from $38.2 million on sales of $733.1 million a year earlier. Especially significant was the 33% jump (from $333.3 million to $446.2 million) in sales outside Japan, to which the acquisition of SSI contributed. In that quarter, TDK derived more than two-thirds of its revenue from the electronic materials and components division, in which sales climbed 17% from a year earlier to reach $576 million.

Sales were strong in products such as magnetic heads, chip capacitors, multilayer chip components, inductors, transformers, and ferrite cores. Due in large part to the SSI acquisition, in fact, revenue from electronics parts is growing faster than sales of the company's well-known magnetic tapes, according to a 1989 report by Yamaichi Securities Co. □

Santoro, product quality has improved by 100%. The company also has set a goal of achieving a product-return rate of no more than one per million by the year 2000.

Realignment and expansion

The acquisition of SSI by TDK is in many ways similar to that of Materials Research Corp. by Sony Corp. in August 1989. MRC, which developed the key metals for the thin-film coating of semiconductor wafers, also had difficulties acquiring the funds for future product developments from its bankers. As an alternative, the company received access to cash in a cordial acquisition by Sony.

After the TDK acquisition, SSI realigned operations to create seven units with profit-and-loss responsibility that focus on market-specific products. Four product lines—for read/write and servo-preamplifier products, pulse detector/filter products, data recovery products, and controller products—focus on storage technology, the bulk of the company's business. The other units focus on modems, digital transmission, and the automobile market.

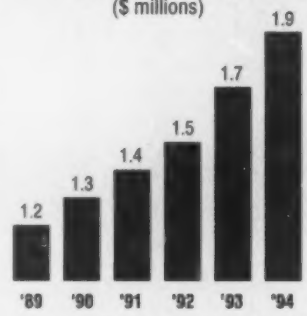
In July, TDK announced plans to invest $100 million to expand production of CMOS and bipolar ICs at both of SSI's California plants to meet demand within SSI's traditional disk-drive and modem markets. In Santa Cruz, 6-inch wafer CMOS equipment on 1.25-micron process is replacing a 4-inch wafer capability on 3-micron process; production at the site is expected to increase by as much as 500%. In all, about 27,000 square feet of Class 1 fab space will be added to the existing 35,000 square feet of Class 100 space. Products will include telecom chips, as well as some automotive chips.

In Tustin, production will increase by about 30% and will eventually include high-speed bipolar ICs, enlarging fab space by 7,000 square feet. The plant now produces 4-inch bipolar and CMOS wafers. Moreover, outside foundry agreements with Oki Electric Industry Co. have been extended. The original agreement called for an exchange of capacity for a license to produce SSI's 1,200-bps modem chip; the new arrangement, however, includes an exchange of SSI's 2,400-bps modem chip for Oki's 8-bit series of microcontrollers.

Yet another move was a technology swap agreement with Philips Components-Signetics of Sunnyvale, Calif. The swap involves technologies used to make ICs for hard-disk drives and includes a bipolar process developed by Signetics.

Autos spell growth for SSI

Total semiconductor market consumption for North American automotive electronics industry ($ millions)



Source: Dataquest Inc.

Changes at SSI also include personnel. Tom George moves into his slot as head of worldwide sales following a stint as vice president of North American sales. Rick Goerner, formerly senior vice president of marketing and sales, was named to a newly created post as senior vice president of business operations overseeing the new business units. Santoro, who was retained as CEO, says that he feels freer to make long-term plans for SSI. In fact, he marvels at the slow, methodical, no-quick-changes style of Japanese management. "I was told I was asking for approval too often," he notes with some bemusement.

Yutaka Mori, senior vice president, calls the SSI acquisition "a nice match" for TDK

Searching for a haven

As survival in the chip business continues to demand ever-higher funds for R&D, more and more independent smaller companies will be forced to find their own solutions to raising needed capital—especially given the currently weak economic environment, contracting venture capital funds, and an uninspired stock market.

For now, at least, SSI management has found its haven in TDK. SSI executives are finally able to devote their attention and energies toward building a billion-dollar company instead of anxiously watching the company's quarterly stock performance. "You almost become addicted to that way of life," says Santoro. "Now I don't have to agonize over my investment. Professionally and personally, I had become a slave to Wall Street." Today, he adds, SSI is much more independent than it ever was as a public company.

But how long SSI maintains its independence remains to be seen. Some observers believe that TDK is treating its new property as an investment rather than a takeover. When questioned on that point, Mori becomes thoughtful. "Frankly, we don't know," he says. "SSI is doing fairly well as an independent operation, so TDK won't intervene unnecessarily."

Still, he continues, everyone recognizes the vast differences between Japanese and American management styles; surprises and misinterpretations are virtually inevitable. "We must always confirm and reconfirm," says Mori. "A couple of small disconnects can cause major divergence."

But for the foreseeable future—five to ten years, according to Mori—TDK's main semiconductor business will be on American soil. "The staff in the United States knows how to do business here," he says. "It is a really interesting experiment which has yet to be proven." □

A tough road ahead for Taiwan's PC makers

Taiwan's economy is getting hammered by both the U.S. slowdown and its own problems. PC makers are seeking new paths to profitability

BY XIONG XIAOGE

The year 1990 was a tough one for Taiwan's personal computer manufacturers. Since exports account for more than 90% of the demand for PCs made in Taiwan, the slowdown of U.S. and European economies has begun to hurt the island's high-tech industry. A Taiwanese government official recently warned that the nation will lose 5% of its exports to the United States if America's economic growth falls by 1%.

But that is not the only thing worrying Taiwan's PC makers. There are some serious domestic problems too. A shortage of engineers, the appreciation of the Taiwanese dollar, rising wages, and inflation have all hit home, as has the virtual collapse of Taiwan's stock market.

Market Intelligence Center of the Institute of Information Industry, a government-sponsored market research agency, says that in 1989 the total production of Taiwan's PC industry (including peripherals and software) reached $1.39 billion, and the island country exported $1.24 billion worth of PC products. From 1987 to 1989, Taiwan's PC production registered an astonishing 41% compounded annual growth rate. In the uncertain economy during 1990, MIC estimates that the annual growth rate of Taiwan's PC industry increased only about 25%, for a total of $1.77 billion in overall production and $1.56 billion in exports.

In the domestic economy, the new Taiwan dollar has appreciated about 25% over the past two years. Wages in Taiwan have increased between 15% to 20% annually since 1988, while the inflation rate runs three times higher than the government's 5% target. "For PC designers and manufacturing engineers, this year's wage increase jumped 30% to 35%," says C. K. Cheng, vice president of Mitac Research Corp., one of Taiwan's largest PC makers.

Taiwan's PC industry is lacking highly qualified engineers, so many companies have been attracting talented engineers away from competitors by offering inflated salaries. Cheng says that Mitac has lost quite a few talented people to its competitors this year.

On Taiwan's stock market, the Weighted Index dropped from a high of 12,682 in February to a low of 2,500 in early October.

"The stock market's slowdown means Taiwan's PC companies will have to rely more on the cash flow generated by their own operations than on new capital investments," says Ta-lin Hsu, managing general partner of Hambrecht & Quist Asia Pacific and director of Taipei-based Hambrecht & Quist Taiwan.

The increasing wage and inflation rates have further slimmed the industry's already below-average profit margin, which, according to Hsu, runs between 3% to 5% in Taiwan.

Mitac made a nice profit of $9.4 million on $145 million in sales in 1989, or over 5%. But the company's profit margin is projected to drop to below 5% in fiscal 1990, says Cheng.

On the other hand, Acer Group, Taiwan's second largest computer maker, has been hit hard already. Acer originally expected to net $25.5 million in fiscal 1990. In August the figure was projected to fall to $18 million and recently dropped to $10.9 million, mainly because of the narrowing profit margin.

One solution to increasing profit margins is to raise prices, but Taiwanese PC makers have relied heavily on

Top 20 computer companies in Taiwan

Source: Hambrecht & Quist Taiwan

lower prices to compete with such U.S. PC giants as IBM and Compaq Computer Corp. "If you want to maintain the profit margin by raising the price, the customers may turn to Compaq- or IBM-made PCs," says Hambrecht & Quist's Hsu. "It is difficult to change the local PC makers' image from sellers of inexpensive products."

"It does not mean the quality of Taiwanese-made PCs cannot compete with U.S.-made PCs. It is really an issue of brand name recognition," says Hsu, "just as a suit tailored in Paris can sell for a higher price than one of identical quality made somewhere else."

Taiwan's PC manufacturers are adjusting, for starters, by upgrading their products, taking on such new technology as laptop computers, and diversifying their markets.

"I believe the uncertain world economy is the major challenge to Taiwan PC makers"

Ta-lin Hsu
Hambrecht & Quist

One of Taiwan's strengths is its quick adaptation to new technologies. The world's first notebook PC was introduced in 1988 when Japan's NEC Corp. announced its Ultralite. Last year, Taiwan witnessed a craze to replace the desktops with laptops and notebook PCs. An MIC report says about 200 Taiwanese PC companies have already started to manufacture portable PCs. But because Taiwan's surface mount technology is still under development, the yield rate of most laptop and notebook PC makers is still below 50%.

"The company with better manufacturing technologies for portable PCs will be in a much stronger position to compete in Taiwan's PC industry," says Mitac's Cheng.

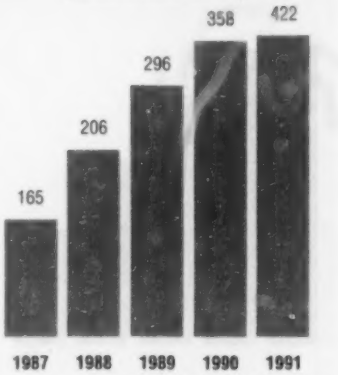
Taiwan's thirst for technology has motivated some PC manufacturers to bring home foreign partners. With about $70 billion in non-gold hard-currency reserves, Taiwan has the world's largest cash hoard, which enables its PC makers to merge with or acquire high-tech companies from foreign countries. By doing so, Taiwanese companies can obtain a higher degree of technological competence and marketing channels.

The Acer Group has been expanding overseas. Its acquisition of Altos Computer Systems Inc. is the largest overseas deal the Taiwan PC industry did last year. Acer paid $94 million to acquire the San Jose-based manufacturer of multiuser systems. "Acer was eager to move upward from a PC manufacturer into a manufacturer of multiuser, multitasking systems, in addition to expanding its marketing channels in the United States," says Hsu.

In addition, the Taiwanese PC manufacturers are making efforts to diversify export markets, and Europe is a major target. According to an MIC report, Taiwan's exports of PCs to Europe topped $672 million in 1989, more than half of the country's total PC exports. MIC estimates Taiwanese PC makers captured a 16.3% share of the total European PC market in 1989.

Taiwan PC production

(units in thousands)



Source: Market Intellegence Center, Institute for Information Industry

"If you look at the revenue generated by each salesperson of any Taiwanese PC company, the figure is always higher in Europe than in other areas," says Mitac's Cheng. According to Cheng, Taiwanese-made PCs are priced 15% to 20% higher in Europe than in the United States because of greater demand. With one major sales office in England and another in Germany, Mitac sells about 40% of its PC products to Europe.

Over the past two years, the growing costs have forced the Taiwanese PC makers to move their manufacturing operations offshore to neighboring Pacific Rim countries where less-expensive labor and land are still available. In 1989, Acer began the construction of its first overseas manufacturing facility in Malaysia. The $20 million plant is scheduled for completion in 1992.

Theoretically, mainland China is an ideal place for Taiwan's cash-rich PC makers to invest. The island is separated by the 100-mile-wide Taiwan Strait from China's Fujian province. The people living on both sides of the strait speak the same language and have the same cultural background. And the average salary of a PC assembly worker in China is less than one-fifteenth of his Taiwanese counterpart's. What's more, the Chinese government has adopted various favorable policies, including a five-year no-tax grace period to attract investment from Taiwan.

At present, Taiwan's PC makers still cannot capitalize on these opportunities because of the Taiwanese government's restrictions, which ban direct investments in the mainland.

Although the Taiwan PC makers have felt the increasing pressure, they have not taken enough action. Hsu estimates that Taiwan PC makers who have invested in Thailand, the Philippines, and other Pacific Rim countries, have spent only between $15 million and $20 million, spanning from 1988 to 1990. □

Multibus II stages comeback in communications

In search of markets not already staked out by VMEbus, vendors discover a potential gold mine in applications for telecom and datacom

BY DAVID WEBB

It has been said that all things come to those who wait. For vendors of Multibus II single-board computer bus products, those things appear to be new applications that may well prove to be the architecture's salvation.

Multibus II vendors have had a tough nut to crack since their first products began trickling onto the market in 1986. Intel Corp. spearheaded the second generation of the bus architecture's development effort, but ironing out details for an agreeable standard was a costly process. VMEbus appeared in volume five or six years ago at just about the peak of the Multibus I lifecycle. As Multibus I matured, vendors of the VMEbus architecture products staked out most of what was left of the market. Multibus II vendors were faced with very few market opportunities that VMEbus had not locked up already, since Multibus I users could not migrate to Multibus II.

But new markets may provide Multibus II with the steam it needs to compete with the VMEbus. Although VMEbus appears to have all but locked up the U.S. industrial process-automation market for single-board computers, new and potentially lucrative applications will give Multibus II vendors growth opportunities outside the secured VMEbus market base of data acquisition, minicomputer systems, and military applications. Moreover, the European market appears to be accepting Multibus II over VMEbus in applications that are dominated by VMEbus in the United States—most notably industrial automation.

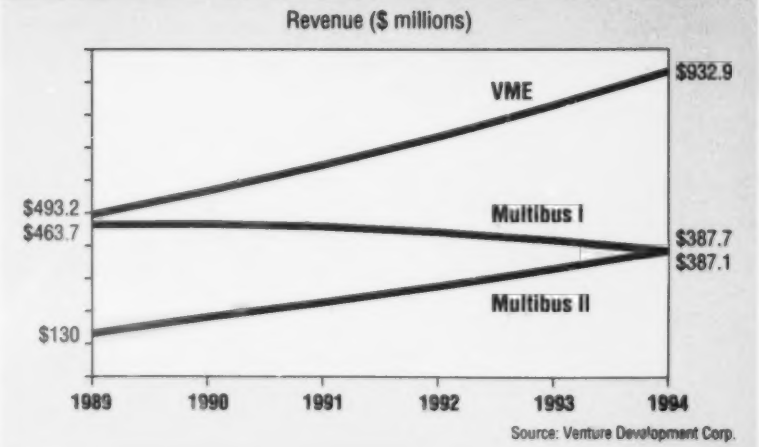
"It seems that Multibus II has come of age in the last year," says Bart Mallio, a bus market research analyst at Natick, Mass.-based Venture Development Corp. "For years it was a technology in search of applications. Finally, it appears there are applications and growth opportunities in areas no one thought of at its conception."

Mallio estimates Multibus II to have a modest 15% share of the industrial process-automation market, which is overwhelmingly dominated by VMEbus. However, the biggest opportunity for Multibus II single-board computer vendors—including Intel, Siemens AG, Mentec Computer Systems Ltd., and Concurrent Technologies Inc.—is the potentially huge telecom and data communications market, for which Mallio and others say the architecture is especially well-suited.

"There is no doubt that communications will drive growth in the Multibus II market," says Mallio, adding that the bus lends itself to multitasking and acting as a communications bridge between systems. Multibus II has more efficient message-passing capabilities than VMEbus, which allows it to send large chunks of data at once and package them for transfer across a network, according to Mallio. Such features are attractive to telecom and datacom companies seeking to convert conventional systems into computer-automated systems.

Mike Richmond, product marketing manager at Intel's Industrial Computer Division in Hillsborough, Ore., agrees with Mallio. "Generally we see [communications applications] as new market share," he says. "No one bus has really penetrated that market." Richmond especially believes that the boom in cellular telephones and networked computer systems will cause Multibus II demand to grow phenomenally within the next three to five years.

VME holds the lead in battle of buses



Source: Venture Development Corp.

While single-board market watchers all agree there is a large market emerging in communications, no one is really sure how large that market is. But estimates from the Multibus Manufacturers Group in Aloha, Ore., appear to support Richmond's claims. MMG predicts that the market for Multibus II products will grow at an impressive 52% compounded annual growth rate through 1995. Len Schulwitz, executive director of MMG, says that Multibus II vendors generated $175 million in worldwide revenue in 1990. At a compounded annual growth rate of 52%, the market would grow to $266 million this year, $404 million in 1992, and $614 million in 1993. If Schulwitz's estimates hold up through 1995, Multibus II vendors could realize revenue totaling $1.4 billion.

But according to Mallio at Venture Development, an independent research firm, the outlook is less bullish. Venture Development estimates a 24% compounded annual growth rate from 1989 to 1994. The firm estimates the market has grown from $130 million in 1989 to $181 million in 1990, and it expects revenue to reach $226 million this year and $331 million by 1993.

The VMEbus market, by comparison, has dwarfed Multibus II to date, and it appears as if it will continue to dominate the single-board systems market for the foreseeable future. The VMEbus International Trade Association (VITA) says the VMEbus market has grown from $600 million in worldwide revenue in 1989 to $700 million for 1990. The association expects that number to continue growing this year to $825 million, followed by steady growth to $930 million in 1992, and to more than $1 billion by the end of 1993.

Venture Development estimates revenue of $566 million in 1990, $645 million in 1991, $734 million in 1992, and $829 in 1993 with a compounded annual growth rate through 1994 of 13.6%.

Aside from Motorola, key VMEbus single-board computer suppliers include Force Computers Inc., SBE Inc., Radstone Technology Inc., and Heurikon Corp. All told, according to Lym Hevle, executive director of VITA, there are about 350 vendors of single-board computer products on the market, the vast majority of which are VMEbus-based.

But Hevle says while Multibus II never really caught on the way VMEbus did, he admits it is growing, despite continued anticipated robust demand for VMEbus products. Surprisingly enough, VMEbus vendors don't really even consider Multibus II a market competitor anymore, much less a threat, says Hevle. "The war, such as it was, is over. We don't really talk about or pay much attention to those guys anymore."

But if the communications market is now wide open, it seems that Multibus has the edge. Intel's Richmond says it is Multibus II's design that is making it attractive not only to the communications market, but to European manufacturers as well.

"It is a layered, disciplined architecture that runs better than VMEbus does within the protocols of computer system networks," Richmond says. Multibus II, according to Richmond, allows communications companies to build upon its Intel 80386-based 32-bit microprocessor platform made possible by new input/output controllers. "[Communications customers] like the clean architecture. It matches the way they think. VMEbus doesn't match the way they think," says Richmond.

For many of the same reasons a second market opportunity for Multibus II vendors—actually a subset of the communications market—is data communications. Major minicomputer systems vendors are also interested in Multibus technology in much the same way that Digital Equipment Corp. is embracing VMEbus for its VAX-based systems.

Intel's Richmond claims that minicomputer manufacturers like Prime Computer Inc., NCR Corp., and Bull HN are all test-driving Multibus II with their system designs, largely because of its bridging capability and ability to handle data in volume. □

Too many Futurebuses

Since 1987, computer chip and board manufacturers have been quietly working together to develop a standardized system bus architecture that would unify VMEbus and Multibus proponents and provide a high-performance solution for the 1990s.

However, enthusiasm over the goal of that effort, known as Futurebus Plus, has waned in recent months. Some vendors and analysts are pushing back expectations of Futurebus's 1991 arrival another year, with slow market growth expected through 1995. That pessimism is being fueled by a factionalizing of the development effort. At least 12 versions of Futurebus are vying for standardization. The outlook is bleak for any one of those proposals to gain enough support to become even a de facto standard within the next two or three years.

"The situation is something like that in Orwell's *Animal Farm*," says Pete Yeatman, president of Radstone Technology Corp., Montvale, N.J. "In this case, all versions of Futurebus are supposed to be equal, but some people are pushing their own versions as more equal than others."

The resultant fragmentation of ideas for what would be the Futurebus standard has some vendors turning back to basics.

"[Futurebus] is definitely off to a nebulous start," he says. "There are some people out there who are sort of crying doom for Futurebus, and some of those were the same people who two to three years ago were playing it up."

Ease of migration is a critical issue for users who have invested thousands—and maybe even millions—in one architecture or the other and now want to leverage the older technology while converting to the new.

But the third-party vendors behind Motorola Corp.'s VMEbus, Intel Corp.'s Multibus II, and Digital Equipment Corp.'s Q-bus are each pushing for profiles closest to their own architectures, leaving little hope that anything but a highly specialized and expensive de facto standard—perhaps two—will emerge.

Mallio isn't expecting Futurebus Plus to arrive in force until 1996, and even then his estimates for worldwide revenue from the architecture is relatively modest at $55 million for that year. □

CASE vendors look to the past to find their future

Disappointing demand for traditional computer-aided software engineering tools has vendors focusing on software maintenance issues

BY PETER BURROWS

Vendors of computer-aided software engineering (CASE) tools have always faced a fundamental business problem: Their products all but ignored their potential customers' most pressing problem.

That problem is software maintenance, which deals with the need to control, revise, streamline, and add to existing programs. Such efforts account for about 80% of all software-development activity, according to a study by Volpe, Welty & Co., a San Francisco investment bank. But while CASE vendors have successfully automated parts of the software-development process for new programs, few products offer any help to companies struggling to maintain sprawling MIS systems or keep track of complex, evolving technical programs. "If you can use CASE to solve only 20% of your problems, what is so great about it?" asks Ian Smith, an information management specialist with AT&T in East Brunswick, N.J.

Now, after years of disappointing sales, CASE vendors have finally turned to program maintenance as an area in which they can be of immediate and strategic use to customers. Following the lead of a cluster of niche players who pioneered the market in the mid-1990s, mainstream competitors such as Cadre Technologies Inc. of Providence, R.I., and Index Technologies Corp. of Cambridge, Mass., have introduced products to help customers make sense of their existing programs. At the same time, large computer vendors such as Digital Equipment Corp. in Maynard, Mass., Hewlett-Packard Co. in Palo Alto, Texas Instruments Inc. in Austin, and IBM are developing CASE environments that include in-house or third-party software maintenance tools.

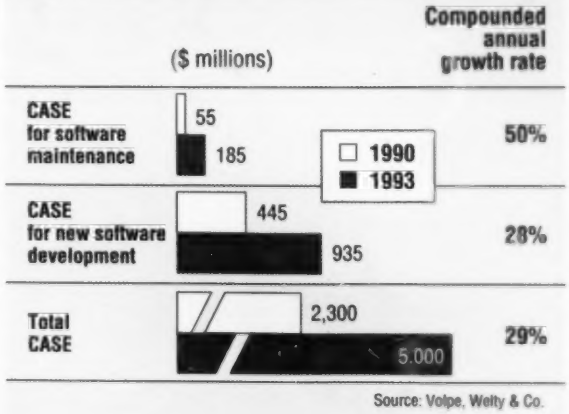
But observers say that the CASE industry has paid a heavy price for its slow reaction to this market opportunity. Less than 3% of all COBOL code—the preferred language of MIS developers—was developed using CASE, according to the Volpe, Welty study. A 1990 survey by CASE vendor CGI Systems Inc. of Pearl River, N.Y., of 25 executives of companies with CASE experience "found tremendous skepticism and an almost universal feeling that CASE is still in its infancy," says Robert Bouton, CGI's vice president of marketing. "The vast majority of executives were unable to provide tangible evidence of any actual benefits."

Suppliers are hoping the new focus on maintenance automation will enable them to overcome this disillusionment with CASE. And while no vendor has yet put together a total solution to the problem, the products now on the market do enable software managers to make some headway. Vendors such as Bachman Information Systems Inc. in Burlington, Mass., Language Technology Inc. and Procase Corp., both in Santa Clara, Calif., and Viasoft Corp. in Phoenix have spent millions to attack specific portions of the problem and now boast they can save 25% or more on total maintenance costs.

This time around, such claims are often more than hype. AT&T's Smith, for example, reports time savings of 25% by using a product from Index Technology to analyze a billing system containing more than a million lines of code. "There has been a lot of yelling by vendors about products that have nothing to do with what we need to accomplish," says Smith. "But the bottom line is that this tool has saved us time. In the end, that is what it is all about."

But just as salvaging a run-down house can be more difficult than building one from scratch, finding solutions for software maintenance problems is in many ways a more daunting task than creating tools for new program development. The required products must work within the customer's existing software-development methodology and must be able to make sense of millions of lines of code that have been thrown together over the years, often by now-departed program-

Software maintenance to outpace CASE



Source: Volpe, Welty & Co.

mers who most likely didn't take the time to document their work. IBM estimates that 47% of the time programmers spend on existing systems is spent trying to understand undocumented or poor-quality code.

"Programmers don't believe in documentation," says Schmuel Halevi, an analyst with Boston-based Technology Research Group. "Programming is closer to poetry than to engineering, so what we need now is some magical tool to find out what the systems designer was originally thinking."

Fortunately for vendors, customers have little choice but to wait for such solutions to arrive. Companies cannot afford to abandon software systems that provide the backbone of their day-to-day operations long enough to tackle the time-consuming job of implementing new systems. Nor can they afford to throw out their investment in existing systems. Rewriting old MIS applications can literally cost millions of dollars. Conventional wisdom states that each line of code costs $25 to develop, and many programs are well over 100,000 lines long.

But companies cannot afford to accept the status quo, either. Software development is taking up an increasing amount of industry's resources. Hewlett-Packard, for example, has gone from a ratio of 70% hardware engineers and 30% software engineers in 1980 to the exact opposite today, the company reports. And maintenance productivity continues to fall as program size and complexity increases, putting a strain on established companies to upgrade their software systems fast enough to remain competitive. One study by DEC indicates that maintenance programmers create only 1 to 2 lines of new code per day versus 10 to 15 lines for new system developers.

Nonetheless, CASE vendors face cultural barriers as they try to sell maintenance-related products. For one, vendors must overcome the reluctance of engineers who have been burned by the hyped-up claims of CASE suppliers in the past. They must also overcome the cowboy mentality of programmers who are not interested in fitting into a structured maintenance methodology and the resistance of systems engineers who are not interested in getting bogged down in code-level analysis. But more important, vendors must deal with customers' lack of understanding of the scope of any effort to automate the maintenance of software systems. "Customers perceive they have a problem and are ready to spend some money," says analyst Vaughan Merlyn of CASE Research Inc. in Bellevue, Wash. "But they are not ready to spend what it takes in terms of training, infrastructure, and new methodologies."

Why automate software maintenance?

Because of the spiralling cost of new software development

Lines of code	Time required	Cost	Typical program
1,000	300 hrs.	$ 10,000	Software utility
10,000	4,000 hrs.	$ 120,000	Simple PC program
100,000	65,000 hrs.	$ 2,000,000	Commercial business application
1,000,000	800,000 hrs.	$25,000,000	Weapons systems or a complete MIS system for a Fortune 500 company

Source: Volpe, Welty & Co.

The three Rs

The software maintenance automation tools on the market fall within three hazily defined groupings:

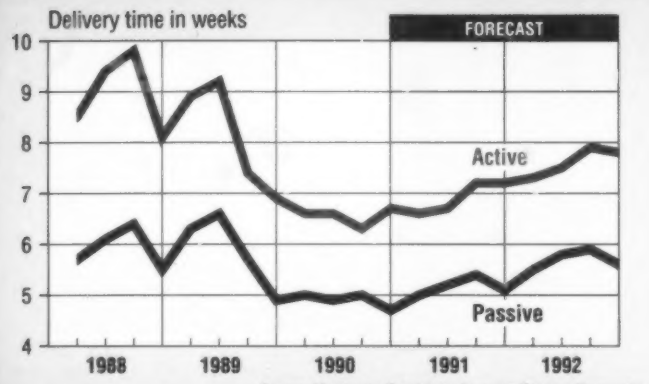
- Reverse engineering. These tools make sense of existing systems. Some simply restructure the source code, weeding out some of the extra baggage and redundancy in the process. Others decipher the code's basic design and present it in easy-to-read graphical structure charts. This simplifies maintenance by letting engineers do their work at the conceptual level rather than at the code level;
- Reengineering. These tools, typically used in tandem with reverse engineering technology, let systems designers restructure and improve upon well-understood existing systems. Some tools, for example, let engineers translate a program into a more sophisticated computer language or transfer to a superior database;
- Reuse. This technology, now largely limited to theory, would enable engineers to partition existing programs into modular building blocks that could then be used to easily create future programs. "The holy grail," says Dave Dayton, executive vice president with Cadre, "is to be able to pick and choose software modules from a software databook, just as we now do with hardware."

While there is much hand-wringing over how to categorize these products, it is clear that they will be a source of fast growth for CASE vendors. One estimate by Volpe, Welty says that the market for maintenance/reengineering tools will grow from $55 million in 1990 to $185 million in 1993—a compounded annual growth rate of 50%. This exceeds the expected growth rate for CASE as a whole, which is slated for 29% annual growth over that time, from $2.3 billion to $5 billion. Volpe, Welty uses a broad definition for CASE that includes such technologies as knowledge-based expert systems and object-oriented databases.

Vendors share these high hopes. Cadre's Dayton expects his company's reverse engineering tool to account for 20% of company sales within the first year. Index president and COO Fred Luconi says that "reverse engineering is probably going to be just as large as forward engineering in the short term."

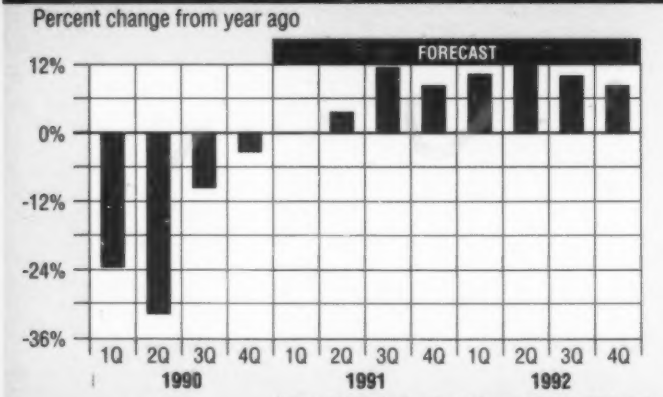
Undoubtedly, some vendors will hawk rudimentary reengineering and reverse engineering tools as a gimmick to spur sales of traditional development tools, observers agree. But at least this time around CASE vendors are addressing the right problem. "Rather than try to revolutionize programming, they have decided to join the real world," says TRG's Halevi. □

Active and passive component lead times



Source: *Electronics Purchasing*; forecast, Cahners Economics

All-electronic component lead times



Source: *Electronics Purchasing*; forecast, Cahners Economics

Lead times in detail

Average delivery time in weeks

	'90	FORECAST '91	'92
Active components	6.6	7.0	7.6
Discrete semiconductors	6.3	6.4	6.9
Integrated circuits	5.4	5.7	6.2
Memory ICs	6.3	6.5	7.4
Displays	7.2	7.4	8.1
Microprocessors	7.4	7.7	8.5
Passive components	4.9	5.2	5.7
Connectors	4.8	5.1	5.7
PCBs	5.0	5.2	6.0
Resistors	4.4	4.8	5.5
Switches	5.2	5.3	5.7
Wire and cable	3.3	3.4	3.9
Relays	6.1	6.5	7.1
Capacitors	5.4	5.6	5.9

Source: Electronics Purchasing & Cahners Economics

Lead time data indicates rising prices in the future

According to a buyer survey by *Electronics Purchasing*, ELECTRONIC BUSINESS's sister publication, lead time for all electronic components fell to a record low of 4.4 weeks in October. In November, however, component lead times jumped to 5.5 weeks. The lead time for all components should stretch to 6 weeks during 1991.

Similarly, the lead time for active components stretched from 4.8 weeks in October to 6.1 weeks in November. Delivery times for both microprocessors and memory ICs contributed the most to the overall increase in November. Passive component lead times also pushed up in November after falling to their lowest level in the previous month. Passive devices stretched 1 week in November, anchoring in at nearly 5 weeks. Connector and switch lead times slowed nearly 2 weeks.

As lead times inch their way up expect prices to head up as well. Get ready for slightly longer lead times later this year as end-market demand picks up.

Lead time data reveals much more than mere delivery times. The information also can be used to explain pricing, identify whether a shortage is cyclical or irregular, assess relative market strength, bolster negotiating position, and evaluate supplier performance.

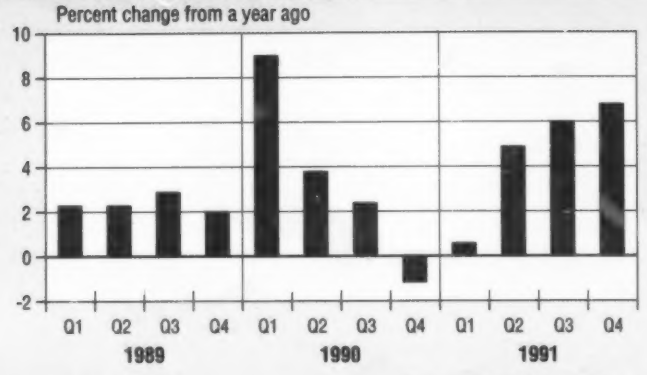
Lead times move in cycles coincident with economic and industrial cyclical patterns and show how much pressure demand is putting on supply. When the economy grows rapidly, for example, demand often outraces supply, lead times stretch, and prices tend to rise. When the economy rises slowly or contracts, on the other hand, supply often surpasses demand, lead times shrink, and prices head down.

A large change in the lead time for a particular component often precedes a change in price. But it is all relative. If a lead time is at the short end of its range and lengthens slightly, the impact on price will be small. If a lead time is at the long range, even a minor change can signal a devastating shortage and disproportionate price inflation.

JULIE HANDELMAN

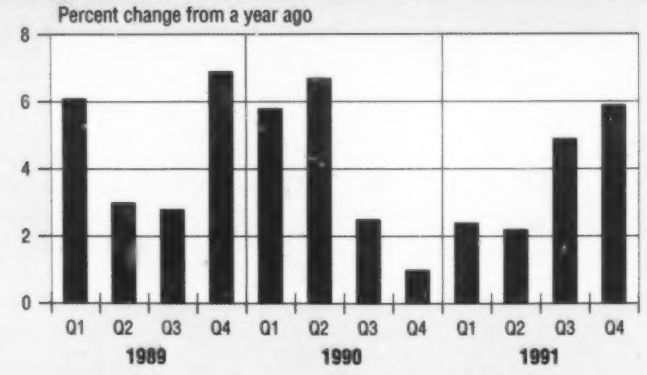
For more information on Cahners Economics' forecasting services, including seminars, newsletters, and database diskettes, contact Dan Buchan at (617) 630-2105, by fax at (617) 630-2100, or write Cahners Economics, 275 Washington St., Newton, MA 02158, U.S.A.

New orders will rise in 1991...



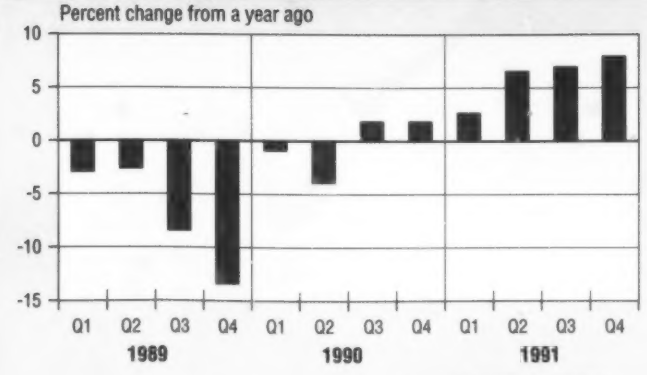
Source: U.S. Dept. of Commerce; forecast, Cahners Economics

...and shipments will follow



Source: U.S. Dept. of Commerce; forecast, Cahners Economics

ATE Index



Source: ELECTRONIC BUSINESS; forecast, Cahners Economics

Instruments and controls expansion ahead

The instruments and controls industry is facing a transitional period as 1991 begins. This year will mark the end of a two-year decline in growth rates, bringing the onset of a two-year expansion. An upturn appeared to start in mid-1990, but the events in the Middle East and low consumer and producer confidence in the second half of the year delayed any recovery.

New orders began 1990 with a surprising first quarter, which came in at 9% above 1989's first quarter. This was followed by more moderate growth of 3.8% in the second quarter. But the third-quarter figure of 2.4% confirmed a delay in a prolonged expansion of the growth rate. The final three-month period of 1990 is expected to show a decline of 1.2% as managers remain wary in an uncertain business climate. And when the picture clears in 1991, new orders will begin to rise and finish the year 4.5% above the total for 1990.

Shipments have shown a similar growth pattern. After leading off 1990 with growth rates of 5.8% and 6.7% in the first two quarters compared with a year ago, growth in shipments dropped to 2.5% in the third quarter. The fourth-quarter growth is expected to slow even further to 1% before heading upward in 1991. The year ahead will end with shipments totaling $55.2 billion, 3.9% above 1990.

Output of instruments and controls will increase in response to higher demand in 1991. Inventory declined slightly in 1990 for the first time since 1987. This will prevent any periods of cutbacks in production before the higher number of new orders push output higher in 1991. An increase of 3% is forecast for the year.

The ELECTRONIC BUSINESS Automatic Test Equipment Sales Index revealed a tough year in 1989 when the index dropped 7.1%. In the third quarter of 1990, the quarterly growth rate posted its first positive number since the fourth quarter of 1988 and will bring the year close to the sales level of 1989. Worldwide sales were expected to total $2.05 billion in 1990, just 0.4% below the previous year's $2.06 billion. Quarterly growth rates will continue to increase throughout 1991, to finish the year with an annual growth rate of 4.6%. This will bring total sales to $2.18 billion in 1991.

JOHN FARRELL